Claims

1. A method of channel estimation in a wireless orthogonal frequency division multiplexed (OFDM) communication system (700), comprises the steps of:

receiving a signal in the time domain;

applying a Fourier transform to said received signal to obtain a frequency domain signal including a plurality of sub-carriers;

estimating probabilities of coded bits for at least said plurality of frequency domain sub-carriers; and

performing channel coefficient estimation for at least said plurality of frequency domain sub-carriers characterised in that

said step of performing channel coefficient estimation for each of said plurality of frequency domain sub-carriers uses channel coefficient estimates for at least one other of said plurality of frequency domain sub-carriers.

2. A method according to claim 1 wherein said step of performing channel coefficient estimation is performed for each sub-carrier using the most recent estimates of other sub-carrier channel coefficients.

3. A method of channel estimation according to Claim 2 wherein said step of performing channel coefficient estimation for substantially each of said plurality of frequency domain sub-carriers uses channel

coefficient estimation benefits from said channel coefficient estimates for substantially all the other frequency domain sub-carriers of said plurality.

4. A method of channel estimation according to Claim 3, wherein said plurality of frequency domain sub-carriers comprises substantially all the sub-carriers of said frequency domain signal.

5. A method of channel estimation according to any one preceding claim and further comprising repeating said steps of estimating probabilities and performing channel coefficient estimation so as to improve iteratively an accuracy of said channel coefficient estimates.

6. A method of channel estimation according to Claim 5, wherein the *k*th channel coefficient estimation is substantially in accordance with the following equation:

$$H_k^{(p+1)} = \frac{\mathrm{P}\left(y_k \middle| x_k, H_k^{(p)}\right)\left[y_k \overline{x_k} - \sigma^2\left(\Delta^{-1}\right)_k \widetilde{H}^{(k)}\right]}{\mathrm{P}\left(y_k \middle| x_k, H_k^{(p)}\right)\left[\left|x_k\right|^2 - \dfrac{\sigma^2}{\upsilon^2} + \dfrac{\upsilon^2}{\gamma^2}\right]}$$

where $H_k^{(p+1)}$ is the (p+1)th estimate and $H_k^{(p)}$ the pth estimate of the channel coefficients, y_k is the received data corresponding to the transmitted data x_k, σ^2 is the channel noise variance, $\widetilde{H}^{(k)}$ is the channel coefficient vector H with a 0 on the kth component and Δ^{-1}, υ^2 and γ^2 have the meanings indicated hereinabove.

7. A method of channel estimation according to any one preceding claim, wherein the step of performing channel coefficient estimates comprises replacing previously estimated channel coefficients of said plurality of frequency domain sub-carriers with respective current channel coefficient estimates.

8. A method of channel estimation according to Claim 5, wherein repeating said step of performing channel coefficient estimation comprises applying a cost function on an Expectation-Maximization algorithm on said plurality of frequency domain sub-carriers to improve said channel coefficient estimates.

9. A method of channel estimation according to Claim 8, wherein said step of performing a channel coefficient estimation includes calculating an auxiliary function, the method further characterised by the step of:

performing a Maximisation process on said auxiliary function in substantially the following manner:

$$Q(H_m, H_m^{(p)}) = E_{x_m}\left[\log P(x_m, y_m, \widetilde{H}^{(m)} \mid H_m) \mid y_m, H_m^{(p)}\right] \quad .$$

10. A method of channel estimation according to Claim 5, wherein said step of performing a channel coefficient estimation includes applying a forward-backward algorithm on said received signal to said plurality of channel coefficient estimates in which estimates are made in a first order of said plurality of frequency domain sub-carriers and subsequently estimates are made in a reversed order of said

plurality of frequency domain sub-carriers so as substantially to equalise an estimation accuracy across said plurality of frequency domain sub-carriers.

11. A method according to any one of claims 1 to 10 wherein the Fourier transform is a Fast Fourier Transform (FFT).

12. An orthogonal frequency division multiplexed (OFDM) receiver for a method of channel estimation as claimed in any one preceding Claim, and comprising:

demodulation means for applying said Fourier transform to said received signal to obtain said frequency domain signal including a plurality of sub-carriers;

decoding means for decoding the received signal and estimating said probabilities of coded bits for at least said plurality of frequency domain sub-carriers; and

channel estimation means for performing channel coefficient estimation for each of said plurality of frequency domain sub-carriers using channel coefficient estimates for at least one other of said plurality of frequency domain sub-carriers.